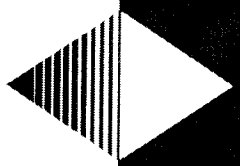
SONY

3-759-861-21(1)

Internal MD DATA
Drive Installation Kit

MDM111-A1



Operating Instructions

Installation Instructions

Note:
Before using this information and the product it supports, be sure to read the Limited Warranty and End-user License Agreement which come with this manual.

■ First Edition (September 1994)

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Owner's Record

The model and serial numbers are located at the bottom. Record the serial number in the space provided below.
Refer to these numbers whenever you call upon your Sony dealer regarding this product.

Model No. MDM111-A1

Serial No. _____

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.

To avoid electrical shock, do not open the drive. Refer servicing to qualified personnel only.

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Laser Compliance Statement

The MD DATA drive that is contained in the Sony Internal MD DATA Installation Kit is a laser product. The MD DATA drive's classification label (shown below) is located on the bottom of the drive.

The MD DATA drive is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products.

CAUTION:
Do not open the drive; no user adjustments or serviceable parts are inside.

Class 1 laser products are not considered to be hazardous. The MD DATA drive has an internal, Class 1, 30-milliwatt, aluminum gallium-arsenide laser that operates at a wavelength of 760 to 800 nanometers. The design of the laser system and the MD DATA drive ensures that there is no exposure to laser radiation above a Class 1 level during normal operation, user maintenance, or servicing conditions.

CAUTION:
Use of controls, adjustments or the performance of procedures other than those specified may result in hazardous radiation exposure.

Welcome !

Welcome to the world of Sony MD DATA! The MD DATA system has been developed based upon Sony's advanced audio MiniDisc technology . Here are some of the capabilities and features you'll discover with the MD DATA system.

Main Features

- Up to 140 MByte of data capacity in a compact, 2.5-inch cartridge.
- Supports all MD DATA: recordable, read-only and hybrid discs.
- Plays back audio MiniDiscs.
- Embedded SCSI-2 interface.
- Direct overwrite scheme eliminates erase phase for recordable discs.
- 150 kByte/sec sustained data transfer rate.
- 2.5 MByte/sec asynchronous and 4.0 MByte/sec synchronous burst transfer rate.
- 5 V single voltage.

Before You Begin the Installation

The Sony Internal MD DATA Installation Kit contains an MD DATA drive that reads and writes MD DATA with up to 140 MB data capacity.

Save these manuals, any extra parts, removed parts and the original package for possible future use.

This kit consists of:

- An MD DATA drive
- A blank recordable MD DATA
- A 3.5-inch floppy diskette containing software required to use the MD DATA drive
- A 50-pin internal SCSI cable (for IBM ThinkPad Dock I connection)
- An instruction manual (this document)

The 3.5-inch floppy diskette contains the MD DATA File System (MDFSEX), device driver (MDMGR), installation programs, some utility programs for DOS, and a 'READ. ME' document for further instruction.

If any parts are missing or damaged, or if you need technical assistance, contact your place of purchase or nearest Sony sales representative.

When you need to return the drive to the Sony authorized service facility for warranty service, be sure to immobilize the optical block and the magnetic head by ejecting the disc, and use the original package (or packaging affording an equal degree of protection) to protect the drive from being damaged during transportation.

Drive Handling Instructions

Please read the following before you remove the drive from the bag:

- Hold the drive by the side rails only.
- To avoid static-electricity buildup;
  - Prevent other people from touching the drive.
  - Try to avoid moving around while installing the drive, since moving around can cause static electricity built up on your body.
- Avoid applying mechanical shock.

Installation Requirements

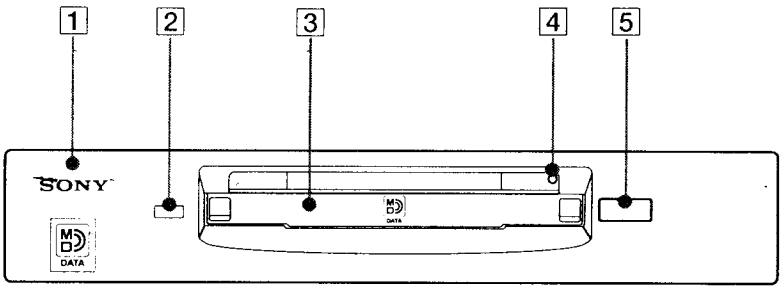
This package provides all of the mounting hardware required for the IBM ThinkPad Dock I (hereafter called the Dock I) and the IBM ThinkPad Dock II (hereafter called the Dock II). In addition to this package, you need the documentation for the ThinkPad computer (hereafter referred to as the computer) and the Dock I/Dock II in which you are installing the MD DATA drive.
If you need to change the MD DATA drive's original SCSI ID (set to 1 at the factory; see page 12 for details), you will also need a pair of tweezers for removing and installing the ID jumpers.

Note:
The version of PC DOS must be 5.0 or later.
OS/2 is not supported.

Controls and Connectors

The following identifies and describes the drive controls and connectors:

Front View



1 Front panel

2 Operation indicator

3 Disc slot

4 Emergency eject hole

5 Eject button

The operation indicator 2 shows the drive activity:

a. When the indicator lights green, the drive is performing a read or write operation, transferring data, or formatting.

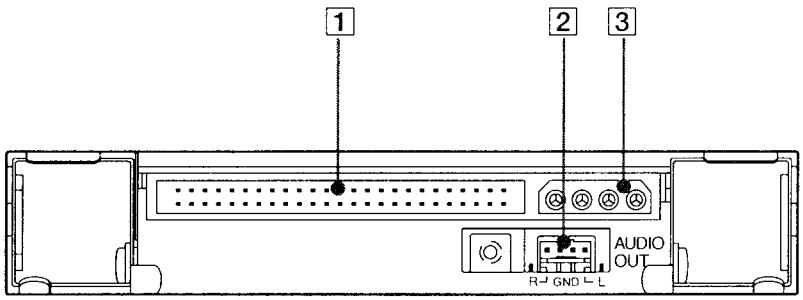
b. When the indicator lights amber, data to be written to the disc is cached in drive buffer memory, but has not yet been physically written to the disc. The buffer is flushed and data is written to the disk after a certain period of time, or before the drive performs any operation such as ejecting the disc.

c. When the indicator is off, the drive is not in active operation nor is any disc inserted in the drive.

Note:
When the drive is in one of the active operation modes (a or b above), the disc does not eject immediately even if the eject button is pushed. However, the drive ejects the disc once the pending operation is completed.

CAUTION
Do not use the emergency eject hole to eject the disc while the drive is in either state a or b. This may destroy data being processed.

Rear View



1 SCSI interface connector

2 Audio stereo lineout connector

3 Power connector

Setting Up and Installing the Drive

This section explains how to prepare the MD DATA drive and the Dock I/Dock II (hereafter called the Dock) for drive installation.

Installation Overview

The procedures that you will follow to set up and install the drive are:

1 Setting the drive's SCSI ID jumpers (page12)

2 Installing the drive (page14)

3 Installing the DOS support software (page 16)

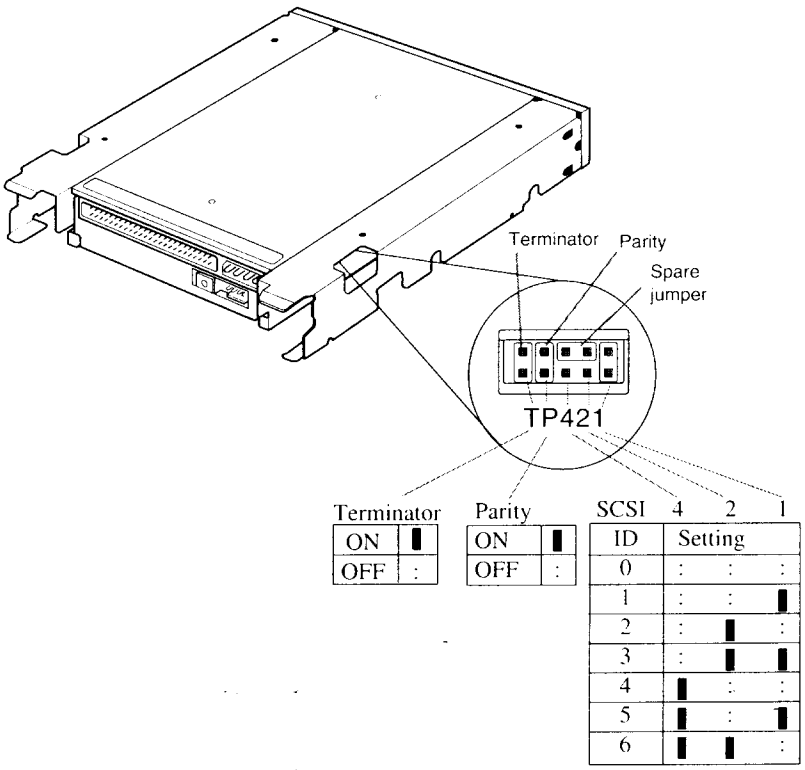
Setting the SCSI ID Jumpers for the Drive

Note:
The MD DATA drive's SCSI ID is set to 1 at the factory. If you do not need to change the ID setting, skip this procedure.

The block of pins on the side of the drive accommodates jumpers that are used to set the SCSI ID and parity, and to enable or disable the terminator.

1 Locate the pin block. The three pairs of pins on the right are used to set the SCSI ID (the jumpers are set at the factory for a SCSI ID of 1).

2 Refer to the following figure and note the settings of jumpers (represented by black rectangles) for the desired SCSI ID.



Terminator	
ON	▮
OFF	:

Parity	
ON	▮
OFF	:

SCSI ID	4	2	1
	Setting		
0	:	:	:
1	:	:	▮
2	:	▮	:
3	:	▮	▮
4	▮	:	:
5	▮	:	▮
6	▮	▮	:

3 Set the SCSI ID. To install a jumper, align the two holes in the bottom of the jumper with the appropriate pins on the pin block. Then, push the jumper onto the pins until it is completely seated and covers both of the pins. If you do not use both of the ID jumpers, store the leftover jumpers in a safe place for future use.

Notes:

- At the factory, a jumper is installed on the Parity pins, enabling parity checking of received SCSI data. When the jumper is removed, parity check is disabled. Parity data is always added to data transmitted from the drive.
- A jumper is installed on the Terminator pins at the factory, enabling SCSI bus terminator. Removing the jumper disables termination. When the terminator is enabled, the MD DATA drive must be the last drive in the SCSI chain.

Installing the Drive

When installing the MD DATA drive into the Dock, refer to the "Installing and Removing IBM Options" pages in the Dock User's Guide.

Note:
This MD DATA drive can be installed into the 1-inch-high drive location in the Dock.

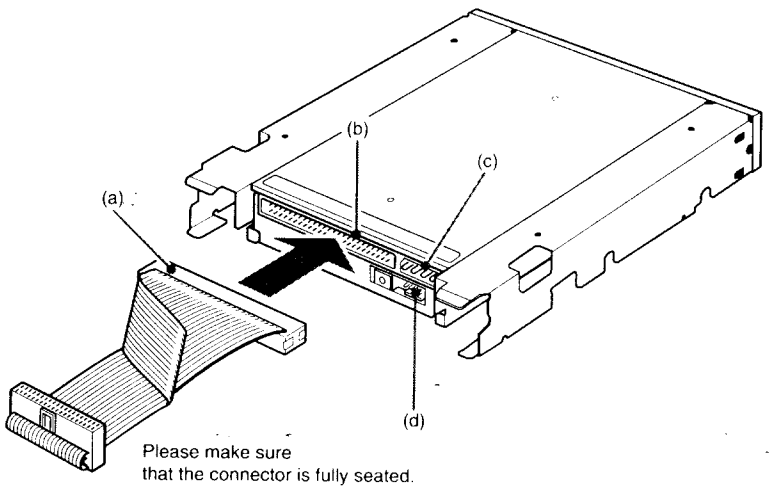
1 Remove the bottom cover of the Dock I. See "Removing the Bottom Cover" in the Dock I User's Guide. When installing the drive in the Dock II, remove the top cover. See "Removing the Top Cover" in the Dock II User's Guide.

2 If you have installed an adapter card in the Dock, remove it. See "Removing the Adapter Card" in the Dock User's Guide.

3 If the blank bezel is installed, remove it. See "Removing the Blank Bezel" in the Dock User's Guide.

4 When installing the drive in the Dock I, connect the 50-pin internal SCSI cable (a) to the drive's SCSI interface connector (b). When installing the drive in the Dock II, use the SCSI cable in the Dock II.

Note:
Arrange the cables inside the Dock so that they can reach the drive. Unfasten the twist-tie(s) if necessary.



5 Set the drive halfway into the Dock's option bay. Then connect the power cable from the Dock to the power connector (c) on the drive. Connect the audio cable from the Dock to the lineout connector (d) on the drive.

6 Push the drive into the Dock's option bay to where it latches into place.
Then connect the other end of SCSI cable to the Dock's SCSI connector. This is required only for the Dock I.

Note:
If you need to remove the drive, you must release the latches. See "Releasing the Latches" in the Dock User's Guide.

7 If you have removed an adapter card, reinstall it.

8 Install the bottom cover on the Dock.

You have now completed installation of the MD DATA drive.

Removing the Drive

To remove the MD DATA drive, perform the installation procedure in the reverse order. See "Removing IBM options" pages in the Dock User's Guide.

Installing the DOS Support Software

To install the DOS support software, follow the instructions below.

1 Make sure that the computer is connected to the Dock, then power on the computer to start the operating system.

2 Insert the 3.5-inch MD DATA floppy diskette into drive A, then double click "File Manager" in "MAIN" window. Select drive A and run SETUP.EXE. In case at the DOS command prompt, type 'A:SETUP' (usually A:\>) and press Enter key.

Note:
Refer to 'READ ME' for more parameters supported by this SETUP utility.

3 Follow the on-screen instructions to install the DOS support software.

4 Exit from the Installation program.

5 Remove the diskette from drive A and restart your computer.

Notes:

- The SETUP program installs the MD DATA File System (MDFSEX) and device driver (MDMGR) into your system. See the 'READ.ME' document for more details.

- The configuration setting made by the SETUP program is described in "Technical Guide" on page 25.
  If your system configuration requires parameters other than those set by the SETUP program, refer to it.

- MD DATA software is compatible with versions of PC DOS 5.0 or later. It may not be compatible with certain software. See 'READ.ME' for details.

To make sure if the DOS support software is installed correctly, try the followings.

(1) Insert the recordable MD DATA (supplied with this kit).
(2) Initialize it with "MDformat" (See page 20).
(3) Try "MDfsck" (See page 21).
Confirm "OK" is displayed.

Now you get the power of MD DATA!

Operating Instructions

This section provides information about MD DATA, saving / retrieving files and installing the MD DATA utility programs.

About Discs

There are two kinds of MD discs; MD DATA and audio MiniDisc. MD DATA was developed for data storage purposes based on the MiniDisc technology, and can be used just like floppy disks or CD-ROMs. The MD DATA drive can read and write MD DATA and play back audio MiniDiscs.

MD DATA

There are three types of MD DATA; recordable, read-only and hybrid. The choice of disc depends on your purpose. This drive supports all three types of MD DATA. A recordable MD DATA needs to be formatted with "MDformat" utility. (See page 20.)

■ Recordable MD DATA

Data can be saved to and retrieved from this kind of disc. Included in this kit.

■ Read-only MD DATA

Just like a CD-ROM, data can only be read from this kind of disc.

■ Hybrid MD DATA

This disc includes both read-only and recordable sections.

MiniDiscs

MiniDiscs may be either prerecorded or recordable. This drive can play back MiniDiscs with the "MDplay" utility.

■ Prerecorded MiniDiscs

Just like a CD, these are strictly for playing music.

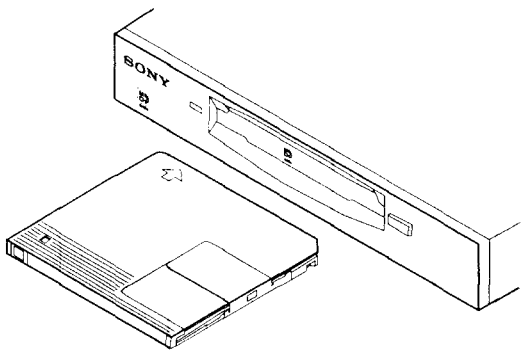
■ Recordable MiniDiscs

These are recordable audio MiniDiscs. This MD DATA drive plays back recorded music. However it cannot record music, nor use the recordable MiniDisc to record data.

Saving / Retrieving Files

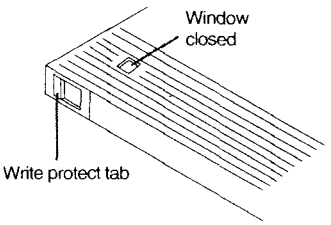
The procedure for saving and retrieving files is basically the same as with other disk storage devices. That is, once the MD DATA drive and its software are installed, you can use MD DATA like a floppy disk.

Insert the MD DATA in the direction of the arrow on the disc.

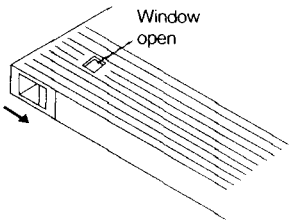


Protecting a recorded MD DATA

To record-protect an MD DATA, slide open the tab at the side of the MD DATA (so that the tab is concealed). In this position, the MD DATA cannot be recorded.



Write enabled



Protected

Notes:

- Do not move the write-protect tab while the MD DATA is inserted into the drive.
- Do not open the shutter or touch the media inside.
- Do not place the cartridge where might be exposed to strong light, high temperature, moisture or dust.
- When cleaning a disc cartridge, wipe it with a dry cloth to remove dirt. Do not use any type of solvent such as alcohol or benzene. Never attempt to clean the disc inside, since doing so may damage the disc surface.
- When shipping an MD DATA drive, be sure to remove the disc from the drive in order to immobilize the optical and magnetic head block.

Utilities

Like CD-ROMs, MD DATA has its own file system (MDFS, an abbreviation for MD DATA File System).
MDFS allows MD DATA to be interchanged between many different computers and consumer products. Since MDFS differs from the file system included with DOS, the utility programs that are provided with DOS cannot be used with MD DATA. The following programs are included on the 3.5-inch floppy diskette in the package.
All utilities can be used on both Windows and DOS.
Detailed information about supported utilities are described in 'READ ME' file.

■ MDformat

Initializes MD DATA. The recordable MD DATA needs to be formatted at the first time. MDformat destroys any data previously written on the disc. Use it as you would use the DOS format utility.

SYNTAX:

```
mdformat [drive:][-q|s][-v:label -o -?]
```

PARAMETERS:

drive:
specifies the drive containing the disc that you wish to format.

SWITCHES:

-q	initializes the disc with 'Quick Format' ('Quick Format' is explained below), default
-s	initializes the disc with 'Safe Format' ('Safe Format' is explained next page)
-v	labels the volume, 31characters max
-o	initialize the disc without any confirmation
-?	help

There are two types of formatting:

Quick Format
This type of formatting initializes the disc quickly. It installs MDFS on the disc, but it does not include WRITE/READ test of the file storage area on the disc. Therefore, you may have a little risk in error correction capability. Below is an example showing initialization of the disc in drive D and labeling the disc with the volume name 'MDDATA.'

```
mdformat d: -qv:MDDATA
```

Quick formatting requires about 1 minute for completion.

Safe Format

This type of formatting initializes and certifies every sector of the disc for the absence of fatal defects. This type of formatting assures reliable storage and retrieval of files. Below is an example showing initialization of the disc in drive D and labeling it with volume name of 'MDDATA.'

```
mdformat d: -sv:MDDATA
```

Safe formatting requires about 35 minutes for completion.

Note:

The supplied MD DATA does not need to be initialized with "Safe format".

■ MDfsck

Checks whether a disc conforms to the MD DATA standard. If the disc has been formatted with other drives, use MDfsck to check the validity of the format. Use it as you would the DOS chkdsk command.

SYNTAX:

```
mdfsck [drive:] [-?]
```

PARAMETERS

drive:

Specifies the drive containing the disc to be checked.

SWITCHES:

-? help

■ MDplay

Plays an audio MiniDisc. Available on Windows also.

SYNTAX:

```
mdplay [-?][drive:] [play [song-number] |
pause | stop | prev | next]
```

PARAMETERS

drive:
Specifies the drive containing the MiniDisc to be played.

play[song-number]:
Start audio. If a [song number] is provided, audio is started at that song number. If [song number] is not provided, audio is started at the first song on the disc unless audio has been previously paused. If playback is paused, playback resumes from the point where it was paused.

pause
Pauses playback. Playback may be resumed using the play parameter.

stop
Stops playback.

prev
Begins playback at the start of the track preceding the one currently being played.

next
Begins playback at the start of the track following the one currently being played.

SWITCHES:

-? help

Troubleshooting

If you experience any of the following difficulties while using the MD DATA drive, use this troubleshooting guide to help you remedy the problem.

Symptom	Cause and / or Solution
Operation indicator does not light when a disc is inserted.	The Dock I/II is not powered on. ---Turn on the power. The power connector inside the Dock I/II is not properly connected to the MD DATA drive. ---See page 14 and check the connections.
The computer system will not start up.	The SCSI ID conflicts with that of another SCSI device(s). --- See page 12 and change the ID of the MD DATA drive to a setting that is not in use.
The computer system will not recognize the MD DATA drive.	The SCSI cable between the Dock I/II and the MD DATA drive is not properly connected at one or both ends. ---See page 14 and check the connections. The DOS support software is not properly installed.---See page16 and check installation of the DOS support software.
No sound comes out of the Dock I/II speakers.	No recorded or prerecorded audio MiniDisc is inserted in the drive. ---Insert an appropriate audio MiniDisc. The audio connector inside the Dock I/II is not properly connected to the MD DATA drive. ---See page 14 and check the connections.

During operation of the software, a variety of messages are displayed when trouble occurs as described below.

Message	Cause and / or Solution
ERROR1: unable to open device driver.	The line DEVICE = drive:[path]\mdmgr.sys needs to be added to the CONFIG.SYS file. Check that the drive is installed correctly
No MD DATA devices found.	Check that DCAM950.EXE is installed correctly. Check that ASPI2CAM.SYS is installed correctly. Note: These are true only for the DOCK I.
Warning: Drive assigned from X	The drive letter specified in the /L: parameter of MDFSEX.EXE has already been assigned to another device. Note: Refer to 'READ ME' file for supported parameters for MDFSEX.EXE.
Warning: X drive(s) not assigned !	No drive letter is available for assignment to the MD DATA drive, so one or more drives were not assigned. Change the LASTDRIVE specification in CONFIG.SYS.
Error: Unsupported DOS Version	The version of your system is not supported. Please use the correct DOS Operating System. (Version 5.0 or later)
Error: Installation is not permitted	Other system software is preventing installation of the MD File System Extensions.
Error: Already installed	The MD File System Extensions have already been installed. You cannot launch the MD File System Extensions more than once. Delete duplicated line from AUTOEXEC.BAT file.
Error: No MD DATA drive is connected !	MDMGR could not find an MD DATA drive to manage. Check the power and SCSI cable connections to the MD DATA drive.
Error: No MDMGR installed	MDMGR is not correctly installed. Check if MDMGR.SYS is in your CONFIG.SYS File.

Technical Guide

This section describes what SETUP program adds on your system.

The DOS AUTOEXEC. BAT File.
The SETUP program adds the following line to your AUTOEXEC.BAT file:

```
[path]\MDFSEX
```

The DOS CONFIG.SYS File.
The SETUP program adds the following lines to your CONFIG.SYS file:

```
DEVICE=[path]\DCAM950.EXE   ]
DEVICE=[path]\ASPI2CAM.SYS  ] These are only for DOCK I.
   .
   .
   .
DEVICE=[path]\MDMGR.SYS
```

Common Troubles

Here're some tips in case your system doesn't work correctly when restarting the computer.

Check order of device driver in CONFIG.SYS
The order of numerous device driver in the CONFIG.SYS file sometimes affects the system operation. To analyze this kind of problem, the simplest way is to disable other device drivers by typing "REM;" at the beginning of each line. Find out which device driver has conflict with the MDMGR.SYS by enabling one by one.

Memory size
Most of the device drivers occupy certain size of memory area. If the device drivers in your system already occupy large portion of memory area and little room for MDFSEX.EXE and MDMGR.SYS, the system may not work. You have to delete drivers which you feel least important until enough memory area is secured for MDFSEX.EXE and MDMGR.SYS.

Note:
If the system hangs during boot, boot the system from the system floppy disk and perform the analysis described above.

Specifications

■ MAIN SPECIFICATIONS

RECORDING CAPACITY	140 MByte
SECTOR SIZE	2048 Byte
RECORDING METHOD	Magnetic Modulation Direct Overwrite system
AVERAGE ACCESS TIME	300 msec (Using read-only MD DATA)
DATA TRANSFER RATE	150 kByte/s
BURST DATA TRANSFER RATE	2.5 MByte/s (Asynchronous)

■ ERROR CONTROL

ERROR CORRECTION SYSTEM	Advanced Cross Interleave Read Solomon Code (ACIRC) plus a 3rd layered ECC
MODULATION SYSTEM	EFM
ERROR RATE	less than 10^{-12}

■ INTERFACE

HOST INTERFACE	SCSI-2
AUDIO	STEREO OUTPUT CONNECTOR (only for playback of recordable MD audio and prerecorded MD audio)

■ LASER DIODE PROPERTIES

TYPE	GaAlAs
WAVE LENGTH	780 nm
OUTPUT POWER	30 mW
N.A.	0.45

■ MECHANICAL CHARACTERISTICS

ROTATION SPEED	420-940 min^{-1} (CLV)
POWER CONSUMPTION	750 mA (read) /5 V
DIMENSIONS (W x D x H)	5.59 x 6.42 x 1.02 inches (142 x 163.1 x 25.8 mm)
WEIGHT	1.1 lbs (500 g)

■ OPERATING CONDITIONS

ENVIRONMENT	
TEMPERATURE RANGE	5 °C to 45 °C (operating)

■ MEDIA

MEDIA FOR DATA	Recordable MD DATA. Read-only MD DATA. Hybrid MD DATA.
MEDIA FOR AUDIO PLAYBACK	Recordable MD audio. Prerecorded MD audio.